

Application No. 09/626,566

Filed: July 27, 2000

Group Art Unit: 1651

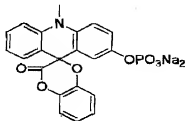
AMENDMENT TO THE CLAIMS

1-7. (Cancelled)

8. (Currently amended) The chemiluminescent substrate of claim 4 43 wherein said counter ions A are selected from the group consisting of CH_3SO_4^- , FSO_3^- , CF_3SO_3^- , $\text{C}_4\text{F}_9\text{SO}_3^-$, $\text{CH}_3\text{C}_6\text{H}_4\text{SO}_3^-$, halide, CF_3COO^- , CH_3COO^- , and NO_3^- .

9-21. (Cancelled)

22. (Currently amended) The chemiluminescent substrate of claim ~~21~~ 61 having the following structure:



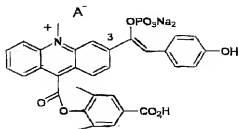
23-24. (Cancelled)

25. (Currently amended) ~~The~~ A chemiluminescent substrate of ~~claim 23~~ having the following structure~~+~~,

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wherein A^- is a counter ion for the electroneutrality of the quaternary nitrogen of the acridinium compounds, said counter ion A^- is selected from the group consisting of $CH_3SO_3^-$, FSO_3^- , $CF_3SO_3^-$, $C_4F_9SO_3^-$, $CH_3C_6H_4SO_3^-$, halide, CF_3COO^- , CH_3COO^- , and NO_3^- .

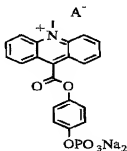
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26-28. (Cancelled)

29. (Currently amended) ~~The~~ A chemiluminescent substrate ~~of~~
~~claim 26~~ having the following structure:

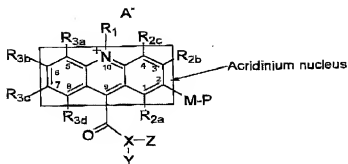


wherein A⁻ is a counter ion for the electroneutrality of the
quaternary nitrogen of the acridinium compounds, said counter
ion A⁻ is selected from the group consisting of CH₃SO₃⁻, FSO₃⁻,
CF₃SO₃⁻, C₄F₉SO₃⁻, CH₃C₆H₄SO₃⁻, halide, CF₃COO⁻, CH₃COO⁻, and NO₃⁻.

30-42. (Cancelled)

43. (Currently amended) ~~The~~ A chemiluminescent substrate of a
hydrolytic enzyme, said substrate having the structure

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wherein

P is PO_3Na_2 or a sugar moiety;

M is oxygen;

R_1 is selected from the group consisting of methyl, sulfopropyl and sulfobutyl;

R_{2a} , R_{2b} , R_{2c} , R_{3a} , R_{3b} , R_{3c} and R_{3d} , are hydrogen;

A^- is a counter ion for the electroneutrality of the quaternary nitrogen of the acridinium compounds, said A^- not being present if said R_1 substituent contains a strongly ionizable group that can form an anion and pair with the quaternary ammonium cationic moiety; and

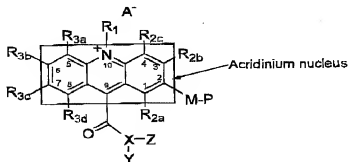
X is selected from the group consisting of O, N or S, such that,

when X is O or S, Y is selected from the group consisting of phenyl, (2',6'-dimethyl-4'-benzyloxycarbonyl)phenyl, and (2',6'-dimethyl-4'-carboxyl)phenyl; and Z is omitted; and

when X is N, Z is toluenesulfonyl, and Y is carboxypropyl.

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44. (Currently amended) ~~The~~ A chemiluminescent substrate of a hydrolytic enzyme, said substrate having the structure,



wherein

P is PO_3Na_2 or a sugar moiety;

M is oxygen;

R_1 is selected from the group consisting of methyl, sulfopropyl and sulfobutyl;

R_{2a} , R_{2b} , R_{2c} , R_{3a} , R_{3b} , R_{3c} and R_{3d} , are hydrogen;

A^- is a counter ion for the electroneutrality of the quaternary nitrogen of the acridinium compounds, said A^- not being present if said R_1 substituent contains a strongly ionizable group that can form an anion and pair with the quaternary ammonium cationic moiety; and

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X is O; Y is selected from the group consisting of phenyl, (2',6'-dimethyl-4'-benzyloxycarbonyl)phenyl, and (2',6'-dimethyl-4'-carboxyl)phenyl; and Z is omitted.

45. (Previously added) The chemiluminescent substrate of claim 43, wherein

P is PO_3Na_2 ;

X is N, Z is toluenesulfonyl, and Y is carboxypropyl.

46. (Previously added) The chemiluminescent substrate of claim 43, wherein

P is PO_3Na_2 ;

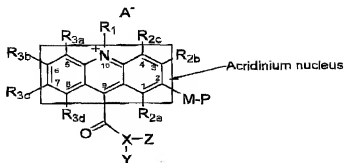
X is S; Y is selected from the group consisting of phenyl, (2',6'-dimethyl-4'-benzyloxycarbonyl)phenyl, and (2',6'-dimethyl-4'-carboxyl)phenyl; and Z is omitted.

47. (New) A chemiluminescent substrate of a hydrolytic enzyme, said substrate having the structure

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wherein

P is PO_3Na_2 or a sugar moiety;

M is oxygen;

R_1 is selected from the group consisting of sulfoalkyl and carboxymethyl;

R_{2a} , R_{2b} , R_{2c} , R_{3a} , R_{3b} , R_{3c} and R_{3d} , can be the same or different, selected from the group consisting of hydrogen, methyl, methoxy, halides, and cyano ($-\text{CN}$);

A^- is a counter ion for the electroneutrality of the quaternary nitrogen of the acridinium compounds, said A^- not being present if said R_1 substituent contains a strongly ionizable group that can form an anion and pair with the quaternary ammonium cationic moiety; and

X is selected from the group consisting of O, N or S, such that,

when X is O or S, Y is selected from the group consisting of phenyl, (2'-methyl)phenyl, (2'-methoxy)phenyl, (2',6'-dimethyl)phenyl, (2'-methyl-6'-methoxy)phenyl, (2',6'-dimethyl-4'-

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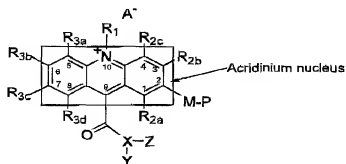
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benzyloxycarbonyl)phenyl, (2',6'-dimethoxy-4'-benzyloxycarbonyl)phenyl, (2'-methyl-6'-methoxy-4'-benzyloxycarbonyl)phenyl, (2',6'-dimethyl-4'-carboxyl)phenyl, (2',6'-dimethoxy-4'-carboxyl)phenyl, and (2'-methyl-6'-methoxy-4'-carboxyl)phenyl; and Z is omitted; and

when X is N, Z is toluenesulfonyl, and Y is carboxypropyl.

48. (New) The chemiluminescent substrate of claim 47 wherein said counter ions A^- are selected from the group consisting of $CH_3SO_4^-$, $F_3SO_3^-$, $CF_3SO_3^-$, $C_4F_9SO_3^-$, $CH_3C_6H_4SO_3^-$, halide, CF_3COO^- , CH_3COO^- , and NO_3^- .

49. (New) A chemiluminescent substrate of a hydrolytic enzyme, said substrate having the structure



wherein

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P is selected from the group consisting of PO_3H_2 , PO_3K_2 , $\text{PO}_3(\text{NH}_4)_2$, PO_3Ca , PO_3Mg and $\text{C}(=\text{O})\text{R}$ group wherein R is an alkyl group having 1 to 6 carbon atoms;

M is oxygen;

R_1 is selected from the group consisting of methyl, sulfopropyl, sulfobutyl, sulfoalkyl, and carboxymethyl;

R_{2a} , R_{2b} , R_{2c} , R_{3a} , R_{3b} , R_{3c} and R_{3d} , can be the same or different, selected from a group consisting of hydrogen, methyl, methoxy, halides, and cyano ($-\text{CN}$);

A^- is a counter ion for the electroneutrality of the quaternary nitrogen of the acridinium compounds, said A^- not being present if said R_1 substituent contains a strongly ionizable group that can form an anion and pair with the quaternary ammonium cationic moiety; and

X is selected from the group consisting of O, N or S, such that,

when X is O or S, Y is selected from the group consisting of phenyl, (2'-methyl)phenyl, (2'-methoxy)phenyl, (2',6'-dimethyl)phenyl, (2'-methyl-6'-methoxy)phenyl, (2',6'-dimethyl-4'-benzyloxycarbonyl)phenyl, (2',6'-dimethoxy-4'-benzyloxycarbonyl)phenyl, (2'-methyl-6'-methoxy-4'-benzyloxycarbonyl)phenyl, (2',6'-dimethyl-4'-carboxyl)phenyl,

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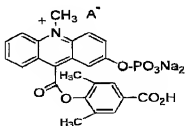
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(2',6'-dimethoxy-4'-carboxyl)phenyl, and (2'-methyl-6'-methoxy-4'-carboxyl)phenyl;; and Z is omitted; and

when X is N, Z is toluenesulfonyl, and Y is carboxypropyl.

50. (New) The chemiluminescent substrate of claim 49 wherein said counter ions A⁻ are selected from the group consisting of CH₃SO₄⁻, FSO₃⁻, CF₃SO₃⁻, C₆F₅SO₃⁻, CH₃C₆H₄SO₃⁻, halide, CF₃COO⁻, CH₃COO⁻, and NO₃⁻.

51. (New) The chemiluminescent substrate of Claim 43 having the structure,



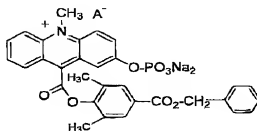
wherein A⁻ is selected from the group consisting of CH₃SO₄⁻, FSO₃⁻, CF₃SO₃⁻, C₆F₅SO₃⁻, CH₃C₆H₄SO₃⁻, halide, CF₃COO⁻, CH₃COO⁻, and NO₃⁻.

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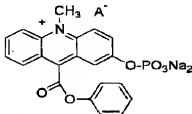
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52. (New) The chemiluminescent substrate of Claim 43 having the structure,



wherein A⁻ is selected from the group consisting of CH₃SO₄⁻, FSO₃⁻, CF₃SO₃⁻, C₄F₉SO₃⁻, CH₃C₆H₄SO₃⁻, halide, CF₃COO⁻, CH₃COO⁻, and NO₃⁻.

53. (New) The chemiluminescent substrate of Claim 43 having the structure,



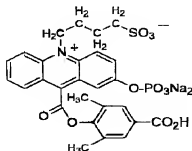
wherein A⁻ is selected from the group consisting of CH₃SO₄⁻, FSO₃⁻, CF₃SO₃⁻, C₄F₉SO₃⁻, CH₃C₆H₄SO₃⁻, halide, CF₃COO⁻, CH₃COO⁻, and NO₃⁻.

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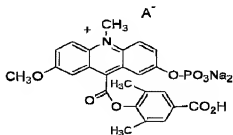
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54. (New) The chemiluminescent substrate of Claim 43 having the structure



55. (New) The chemiluminescent substrate of Claim 47 having the structure,



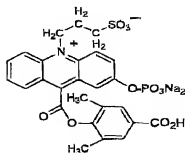
wherein A⁻ is selected from the group consisting of CH₃SO₃⁻, FSO₃⁻, CF₃SO₃⁻, C₄F₉SO₃⁻, CH₃C₆H₄SO₃⁻, halide, CF₃COO⁻, CH₃COO⁻, and NO₃⁻.

56. (New) The chemiluminescent substrate of Claim 43 having the structure

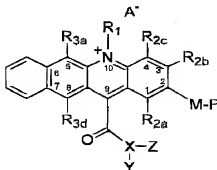
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57. (New) A chemiluminescent substrate of having the structure



wherein

P is selected from the group consisting of PO_3H_2 ,

PO_3K_2 , $\text{PO}_3(\text{NH}_4)_2$, PO_3Ca , PO_3Mg , PO_3Na_2 , a sugar moiety and $\text{C}(=\text{O})\text{R}$ group

wherein R is an alkyl group having 1 to 6 carbon atoms;

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M is oxygen;

R₁ is selected from the group consisting of methyl, sulfopropyl, sulfobutyl, sulfoalkyl, and carboxymethyl;

R_{2a}, R_{2b}, R_{2c}, R_{3a}, and R_{3d}, can be the same or different, selected from a group consisting of hydrogen, methyl, methoxy, halides, cyano (-CN), ;

A⁻ is a counter ion for the electroneutrality of the quaternary nitrogen of the acridinium compounds, said A⁻ not being present if said R₁ substituent contains a strongly ionizable group that can form an anion and pair with the quaternary ammonium cationic moiety; and

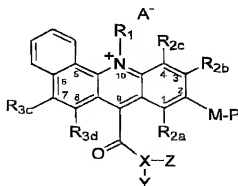
X is selected from the group consisting of O, N or S, such that,

when X is O or S, Y is selected from the group consisting of phenyl, (2'-methyl)phenyl, (2'-methoxy)phenyl, (2',6'-dimethyl)phenyl, (2'-methyl-6'-methoxy)phenyl, (2',6'-dimethyl-4'-benzyloxycarbonyl)phenyl, (2',6'-dimethoxy-4'-benzyloxycarbonyl)phenyl, (2'-methyl-6'-methoxy-4'-benzyloxycarbonyl)phenyl, (2',6'-dimethyl-4'-carboxyl)phenyl, (2',6'-dimethoxy-4'-carboxyl)phenyl, and (2'-methyl-6'-methoxy-4'-carboxyl)phenyl,; and Z is omitted; and

when X is N, Z is toluenesulfonyl, and Y is carboxypropyl.

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58. (New) A chemiluminescent substrate having the structure



wherein

P is selected from the group consisting of PO_3H_2 , PO_3K_2 , $\text{PO}_3(\text{NH}_4)_2$, PO_3Ca , PO_3Mg , PO_3Na_2 , a sugar moiety and $\text{C}(=\text{O})\text{R}$ group wherein R is an alkyl group having 1 to 6 carbon atoms;

M is oxygen;

R_1 is selected from the group consisting of methyl, sulfoethyl, sulfoisopropyl, sulfoisobutyl, sulfoalkyl, and carboxymethyl;

R_{2a} , R_{2b} , R_{2c} , R_{3c} and R_{3d} , can be the same or different, selected from a group consisting of hydrogen, methyl, methoxy, halides, and cyano ($-\text{CN}$);

A^- is a counter ion for the electroneutrality of the quaternary nitrogen of the acridinium compounds, said A^- not being

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wherein

P is selected from the group consisting of PO_3H_2 , PO_3K_2 , $\text{PO}_3(\text{NH}_4)_2$, PO_3Ca , PO_3Mg , PO_3Na_2 , a sugar moiety and $\text{C}(=\text{O})\text{R}$ group wherein R is an alkyl group having 1 to 6 carbon atoms;

M is oxygen;

R_1 is selected from the group consisting of methyl, sulfopropyl, sulfobutyl, sulfoalkyl, and carboxymethyl;

R_{2a} , R_{2b} , R_{2c} , R_{3a} , and R_{3b} can be the same or different, selected from a group consisting of hydrogen, methyl, methoxy, halides, cyano ($-\text{CN}$), ;

A^- is a counter ion for the electroneutrality of the quaternary nitrogen of the acridinium compounds, said A^- not being present if said R_1 substituent contains a strongly ionizable group that can form an anion and pair with the quaternary ammonium cationic moiety; and

X is selected from the group consisting of O, N or S, such that,

when X is O or S, Y is selected from the group consisting of phenyl, (2'-methyl)phenyl, (2'-methoxy)phenyl, (2',6'-dimethyl)phenyl, (2'-methyl-6'-methoxy)phenyl, (2',6'-dimethyl-4'-benzyloxycarbonyl)phenyl, (2',6'-dimethoxy-4'-benzyloxycarbonyl)phenyl, (2'-methyl-6'-methoxy-4'-

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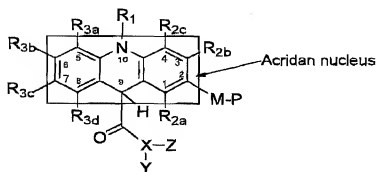
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benzyloxycarbonyl)phenyl, (2',6'-dimethyl-4'-carboxyl)phenyl, (2',6'-dimethoxy-4'-carboxyl)phenyl, and (2'-methyl-6'-methoxy-4'-carboxyl)phenyl,; and Z is omitted; and

when X is N, Z is toluenesulfonyl, and Y is carboxypropyl.

60. (New) A chemiluminescent substrate of a hydrolytic enzyme, said substrate having the structure



wherein

P is selected from the group consisting of PO_3H_2 , PO_3K_2 , $\text{PO}_3(\text{NH}_4)_2$, PO_3Ca , PO_3Mg , PO_3Na_2 , a sugar moiety and $\text{C}(=\text{O})\text{R}$ group wherein R is an alkyl group having 1 to 6 carbon atoms;

M is oxygen;

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R₁ is selected from the group consisting of methyl, sulfopropyl, sulfobutyl, sulfoalkyl, and carboxymethyl;

R_{2a}, R_{2b}, R_{2c}, R_{3a}, R_{3b}, R_{3c} and R_{3d}, can be the same or different, selected from a group consisting of hydrogen, methyl, methoxy, halides, cyano (-CN), ;

A⁻ is a counter ion for the electroneutrality of the quaternary nitrogen of the acridinium compounds, said A⁻ not being present if said R₁ substituent contains a strongly ionizable group that can form an anion and pair with the quaternary ammonium cationic moiety; and

X is selected from the group consisting of O, N or S, such that,

when X is O or S, Y is selected from the group consisting of phenyl, (2'-methyl)phenyl, (2'-methoxy)phenyl, (2',6'-dimethyl)phenyl, (2'-methyl-6'-methoxy)phenyl, (2',6'-dimethyl-4'-benzyloxycarbonyl)phenyl, (2',6'-dimethoxy-4'-benzyloxycarbonyl)phenyl, (2'-methyl-6'-methoxy-4'-benzyloxycarbonyl)phenyl, (2',6'-dimethyl-4'-carboxyl)phenyl, (2',6'-dimethoxy-4'-carboxyl)phenyl, and (2'-methyl-6'-methoxy-4'-carboxyl)phenyl,; and Z is omitted; and

when X is N, Z is toluenesulfonyl, and Y is carboxypropyl.

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The chemical structure shows a phthalocyanine derivative. It features a central macrocyclic ring with four nitrogen atoms (N1, N2, N3, N4) and four carbon atoms (C1, C2, C3, C4). The ring is substituted with various groups: R1, R2a, R2b, R2c, R3a, R3b, R3c, R3d, R11, and M-F. The central carbon atom is bonded to a phenyl ring (R11) and a carbonyl group (C=O). The carbonyl group is further substituted with X1 and Z1. The central carbon atom is also bonded to X2 and Z2. The central carbon atom is also bonded to a phenyl ring (R11) and a carbonyl group (C=O). The carbonyl group is further substituted with X1 and Z1. The central carbon atom is also bonded to X2 and Z2.

P is selected from the group consisting of PO_3H_2 , PO_3K_2 , $\text{PO}_3(\text{NH}_4)_2$, PO_3Ca , PO_3Mg , PO_3Na_2 , a sugar moiety and $\text{C}(=\text{O})\text{R}$ group wherein R is an alkyl group having 1 to 6 carbon atoms;

R₁ is selected from the group consisting of methyl, sulfopropyl, sulfobutyl, sulfoalkyl, and carboxymethyl;

R_{2a} , R_{2b} , R_{2c} , R_{3a} , R_{3b} , R_{3c} and R_{3d} , can be the same or different, selected from a group consisting of hydrogen, methyl, methoxy, halides, cyano ($-CN$), ;

A⁻ is a counter ion for the electroneutrality of the quaternary nitrogen of the acridinium compounds, said A⁻ not being present if said R₁ substituent contains a strongly ionizable group

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that can form an anion and pair with the quaternary ammonium cationic moiety; and

X_1 and X_2 are the same or different and are selected from the group consisting of O, N or S, such that,

when X_1 and X_2 are O or S, R_{11} is selected from the group consisting of hydrogen, -R, substituted or unsubstituted aryl, halides, nitro, sulfonate, sulfate, phosphonate, $-CO_2H$, $-C(O)OR$, cyano ($-CN$), $-SCN$, $-OR$, $-SR$, $-SSR$, $-C(O)R$, $-C(O)NHR$, ethylene glycol, or polyethylene glycol, where R is as defined above; and Z_1 and Z_2 are omitted; and

when at least one of X_1 and X_2 is N, Z_1 and Z_2 are toluenesulfonyl, and R_{11} is carboxypropyl.